EBRAINS

How can EBRAINS support your research?

France Nivelle, Member of the Management Board
Chief Communication and Content officer
Dr. Archana Golla, University of Oslo, EBRAINS data curator

FLAG-ERA webinar, March 16th 2023

Points addressed today

- What is the EU research infrastructure EBRAINS?
- EBRAINS services related to the sub-call topic
  - Data and Knowledge services for finding and publishing FAIR data
  - The Brain Atlas for integrating and combining data in atlases
- EBRAINS access modalities and services costs

These slides will be shared on the FLAG-ERA website after this webinar!

EBRAINS: enabling brain health research breakthroughs

What it is

- European *Research Infrastructure*
- Digital
- Open and collaborative
- On the *ESFRI* roadmap
- Collection of cutting-edge data, atlases, modelling and simulation engines
- Participates and supports participation to Funding Call applications

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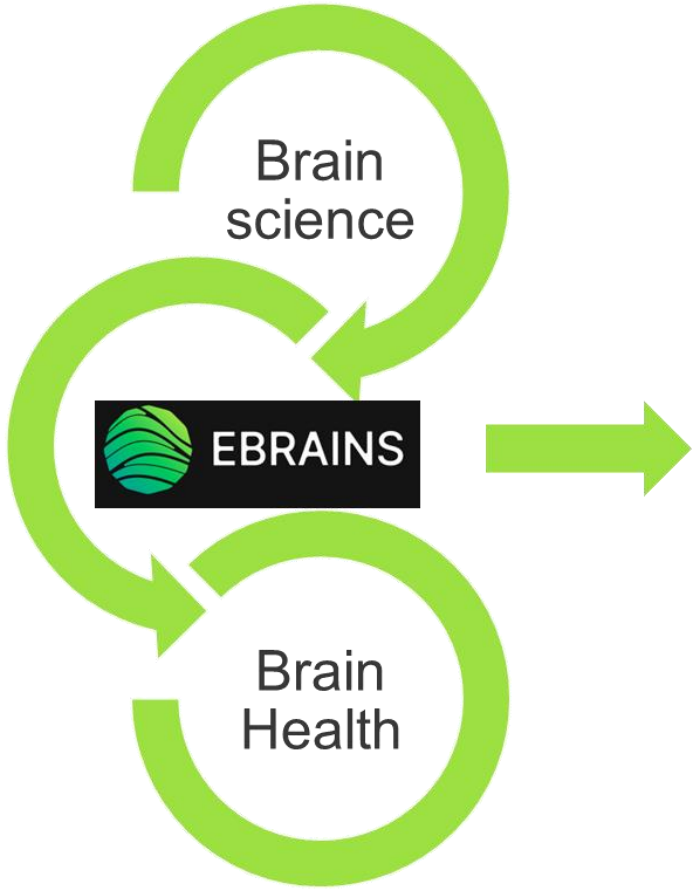
Where it comes from

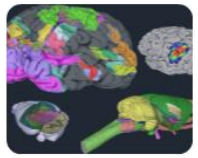
- The **Human Brain Project** (EU-Flagship project)
- 10 years of **multi-disciplinary** work to "decode the brain" (2013-2023)
- **> 500** researchers
- **> 150** EU academic institutions
- **> 2600** scientific publications

EBRAINS: a bridge between scientific theory and health applications



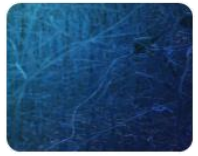
Data and Knowledge

- Online solutions to facilitate storing of, sharing of, access to and use of research data, computational models and software, workflows



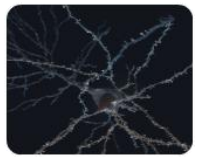
Atlases

- Navigate, characterise and analyse information on the basis of anatomical location



Simulation

- Solutions for brain researchers to conduct sustainable simulation studies and share their results



Brain-Inspired Technologies

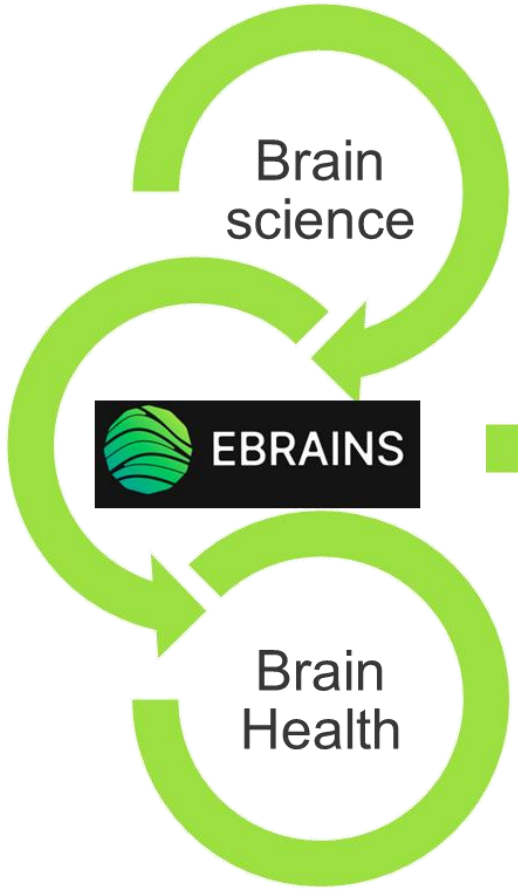
- Understand and leverage the computational capabilities of spiking neural networks

Medical Data Analytics

- Platforms covering key areas in clinical neuroscience research

Interoperable and integrated

EBRAINS: a bridge between scientific theory and health applications



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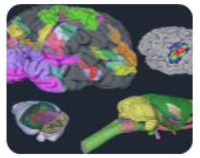

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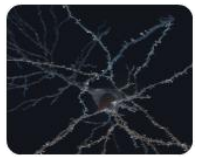

Brain-Inspired Technologies

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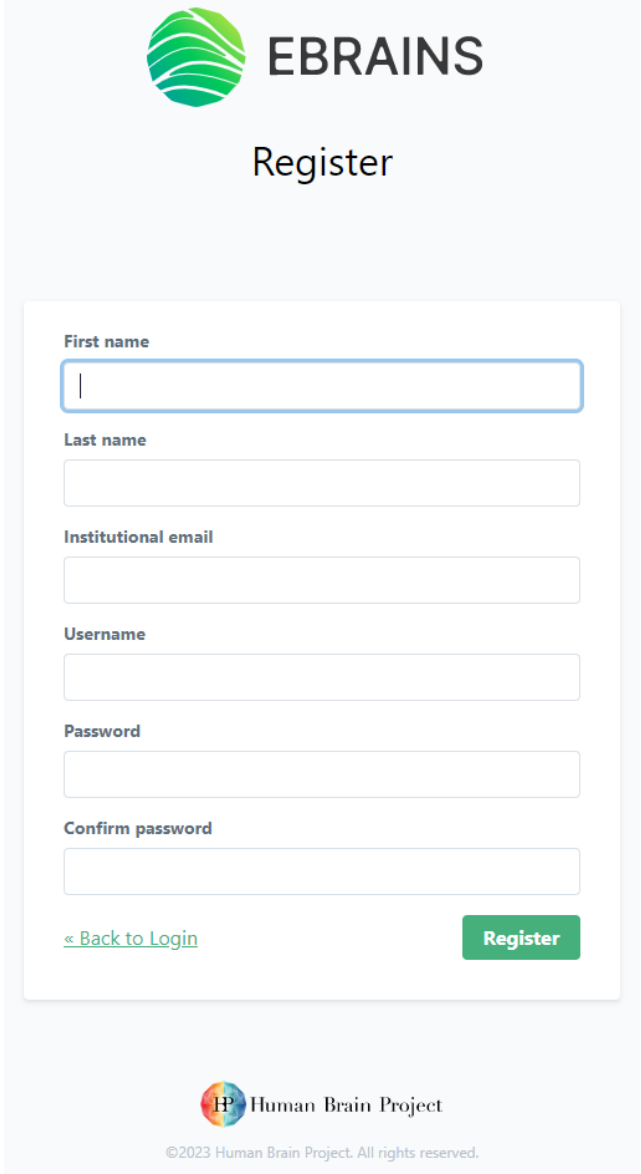
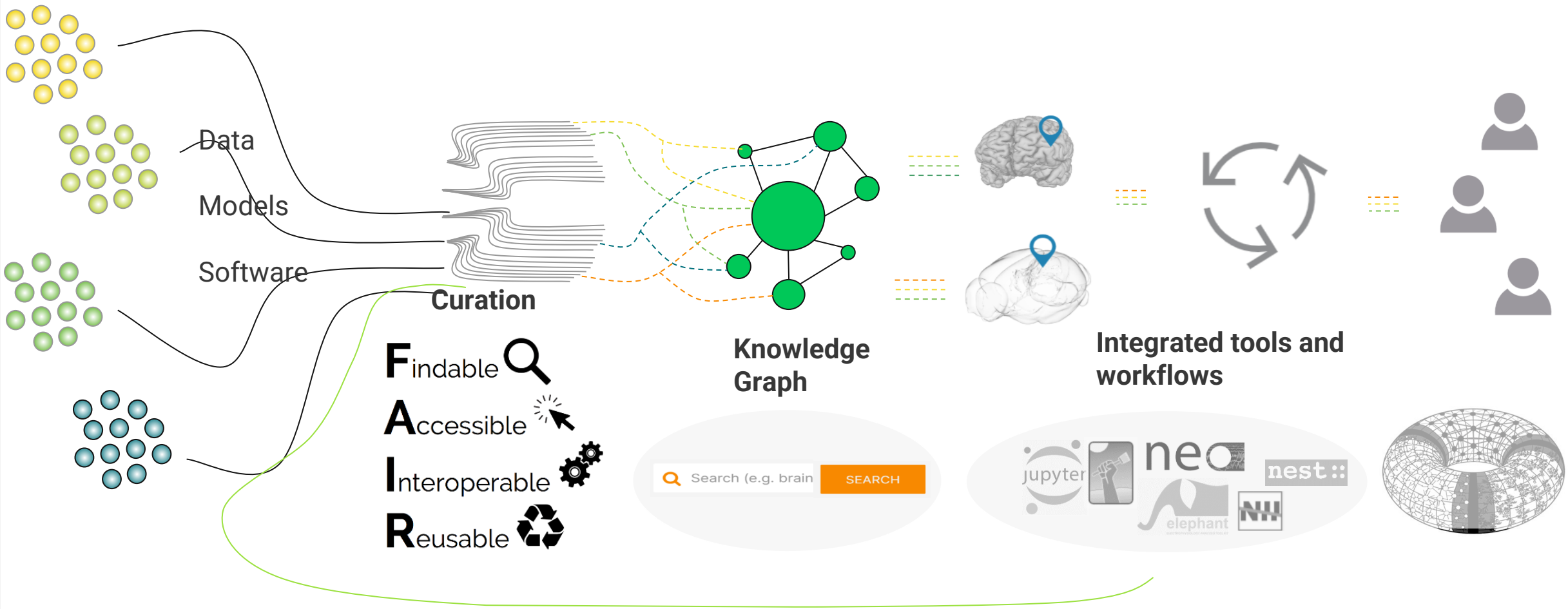
EBRAINS access modalities

- Several of the services provided by EBRAINS are openly available online: ebrains.eu

- An EBRAINS account is required for extended access to tools and resources. EBRAINS accounts are available for free to users across the world following EU regulations.
  - Register for an EBRAINS account here: **https://ebrains.eu/register**

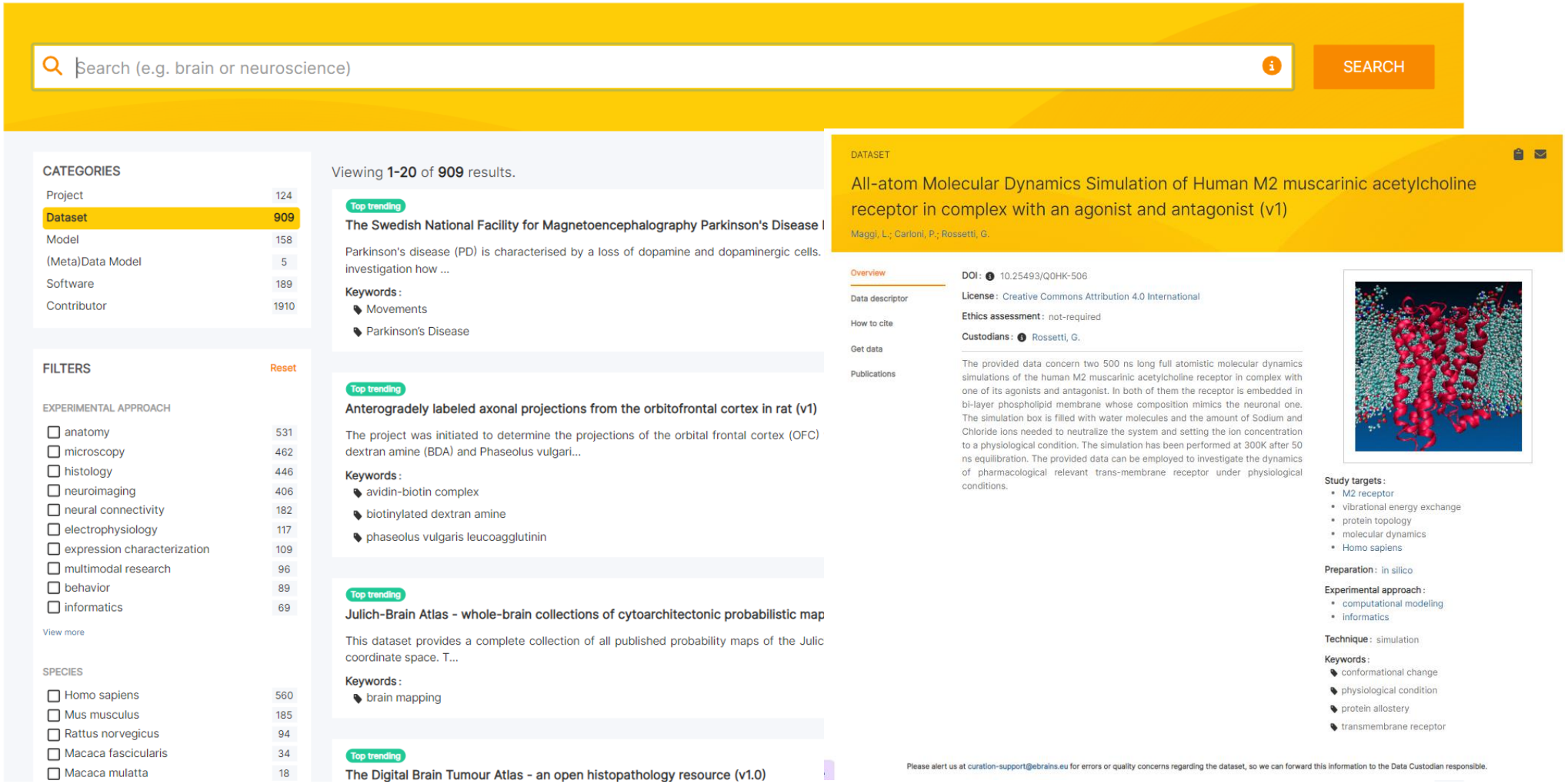


EBRAINS components: “Share – Find – Use”



Find FAIR data on EBRAINS

EBRAINS Knowledge graph search: https://search.kg.ebrains.eu/



Access the data on EBRAINS

The use of the EBRAINS website, its tools, services and data is subject to the terms and policies such as the General Terms of Use, the Access Policy, the Data Use Agreement or the Data Provision Protocol. More information can be found at https://ebrains.eu/terms

Atlas services at EBRAINS

https://ebrains.eu/services/atlases/

ATLASES **Mouse Brain Atlas**	Explore open access 3D anatomical atlas for the mouse brain
ATLASES **QuickNII and VisuAlign**	Spatially register mouse and rat serial 2D brain images to 3D reference atlases
ATLASES **QUINT**	Extract, quantify and analyse labelled features from rodent histological images
ATLASES **Rat Brain Atlas**	Explore open access 3D anatomical atlas for the rat brain
ATLASES **VoluBA**	Spatially register high-resolution volumes of interest to 3D reference atlases
ATLASES **Multilevel Human Brain Atlas**	A three-dimensional atlas that integrates the different facets of human brain organisation at the millimeter and micrometer level
ATLASES **JuGEx**	Gene expression analysis in human brain atlas regions
ATLASES **Multilevel Macaque Monkey Brain Atlas**	A three-dimensional atlas that integrates the different facets of macaque monkey brain organisation at the millimeter and micrometer level

Atlas services at EBRAINS: Reference brain atlases

https://ebrains.eu/services/atlases/

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Atlas services at EBRAINS: Integrate data to an atlas

https://ebrains.eu/services/atlases/

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Atlas services at EBRAINS: Analyse data

https://ebrains.eu/services/atlases/

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EBRAINS data sharing workflow

Submit a data curation request form
https://nettskjema.no/a/104328#/page/1

1

2

Track selection

1 **Common curation track** (medium degree of FAIR)

2 **Advanced curation track** (high degree of FAIR)

Metadata submission

openMINDS

GitHub

1 Via online web form (Wizard)

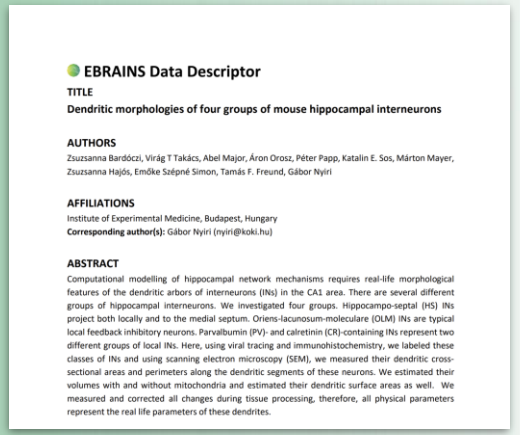
2 Programmatically (Python)

3

Data descriptor submission

4

Elaborate on data acquisition methods, authors and data organisation



EBRAINS Data Descriptor

TITLE

Dendritic morphologies of four groups of mouse hippocampal interneurons

AUTHORS

Zsuzsanna Bardóczi, Virág T Takács, Abel Major, Áron Orosz, Péter Papp, Katalin E. Sos, Márton Mayer, Zsuzsanna Hajós, Emőke Szépné Simon, Tamás F. Freund, Gábor Nyíri

AFFILIATIONS

Institute of Experimental Medicine, Budapest, Hungary

Corresponding author(s): Gábor Nyíri (nyiri@koki.hu)

ABSTRACT

Computational modelling of hippocampal network mechanisms requires real-life morphological features of the dendritic arbors of interneurons (INs) in the CA1 area. There are several different groups of hippocampal interneurons. We investigated four groups. Hippocampo-septal (HS) INs project both locally and to the medial septum. Oriens-lacunosum-moleculare (OLM) INs are typical local feedback inhibitory neurons. Parvalbumin (PV)- and calretinin (CR)-containing INs represent two different groups of local INs. Here, using viral tracing and immunohistochemistry, we labeled these classes of INs and using scanning electron microscopy (SEM), we measured their dendritic cross-sectional areas and perimeters along the dendritic segments of these neurons. We estimated their volumes with and without mitochondria and estimated their dendritic surface areas as well. We measured and corrected all changes during tissue processing, therefore, all physical parameters represent the real life parameters of these dendrites.

Questions about this sub-call and EBRAINS? Contact **flag-era.JTC2023@ebrains.eu**

EBRAINS data sharing workflow

Data upload

FENIX

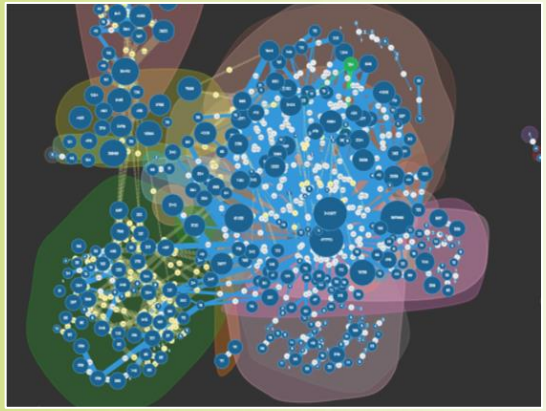
10 years storage

5

Metadata ingestion

Metadata are
- ✓ curated
- ✓ integrated

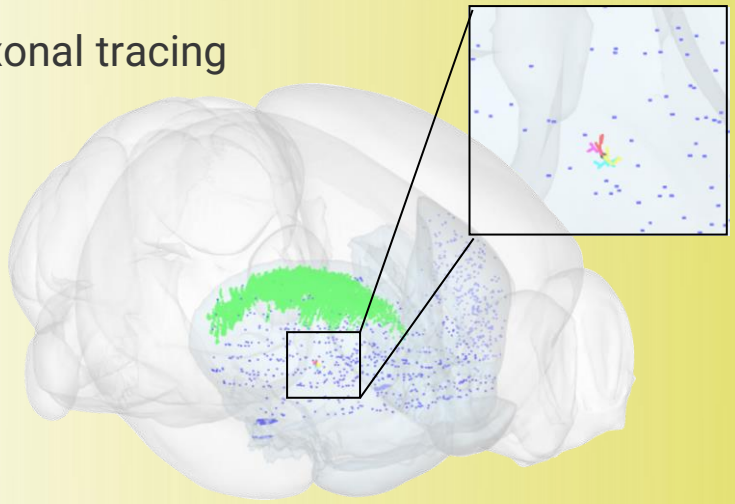
6 into the EBRAINS Knowledge Graph



Atlas registration

Immunohistochemistry

Axonal tracing



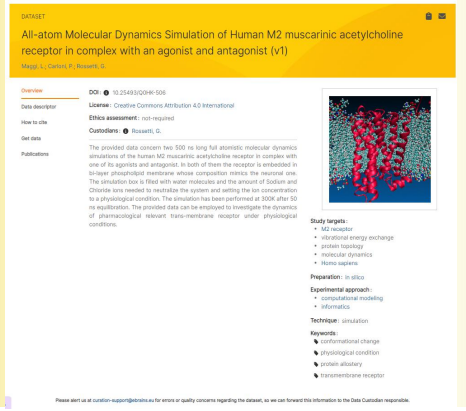
Neuronal reconstruction

7

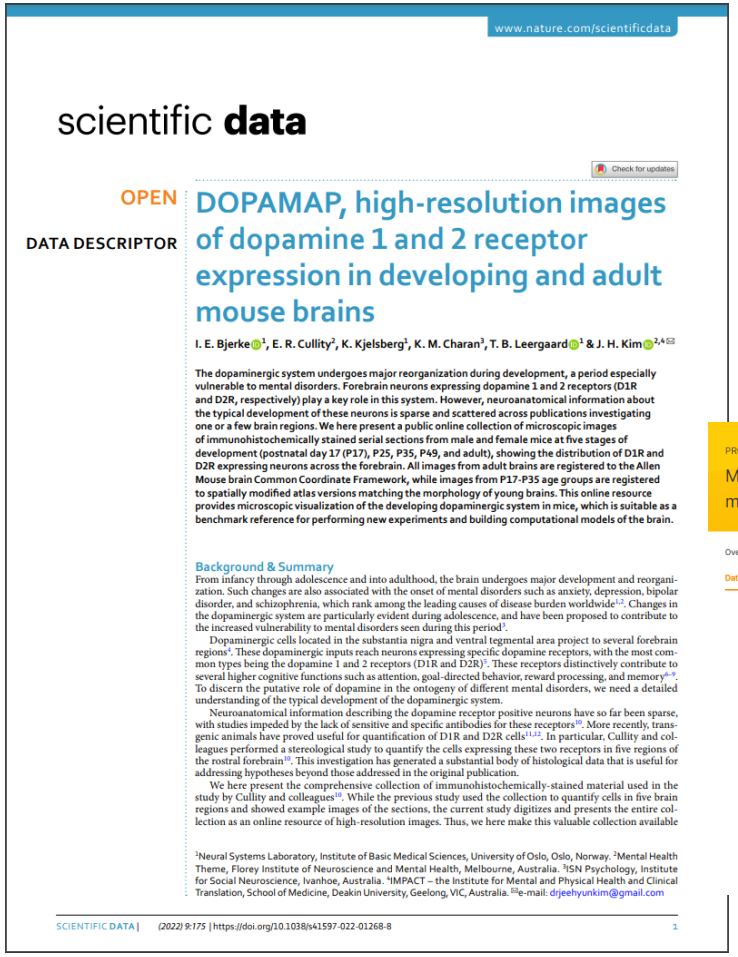
Dataset publication

8

Dataset card can be found through the knowledge graph search



Dataset publication with EBRAINS



www.nature.com/scientificdata

scientific data

Check for updates

OPEN

DATA DESCRIPTOR

DOPAMAP, high-resolution images of dopamine 1 and 2 receptor expression in developing and adult mouse brains

I. E. Bjerke[1], E. R. Cullity[2], K. Kjelsberg[1], K. M. Charan[3], T. B. Leergaard[1] & J. H. Kim[2,4]

The dopaminergic system undergoes major reorganization during development, a period especially vulnerable to mental disorders. Forebrain neurons expressing dopamine 1 and 2 receptors (D1R and D2R, respectively) play a key role in this system. However, neuroanatomical information about the typical development of these neurons is sparse and scattered across publications investigating one or a few brain regions. We here present a public online collection of microscopic images of immunohistochemically stained serial sections from male and female mice at five stages of development (postnatal day 17 (P17), P25, P35, P49, and adult), showing the distribution of D1R and D2R expressing neurons across the forebrain. All images from adult brains are registered to the Allen Mouse brain Common Coordinate Framework, while images from P17-P35 age groups are registered to spatially modified atlas versions matching the morphology of young brains. This online resource provides microscopic visualization of the developing dopaminergic system in mice, which is suitable as a benchmark reference for performing new experiments and building computational models of the brain.

Background & Summary

From infancy through adolescence and into adulthood, the brain undergoes major development and reorganization. Such changes are also associated with the onset of mental disorders such as anxiety, depression, bipolar disorder, and schizophrenia, which rank among the leading causes of disease burden worldwide[1,2]. Changes in the dopaminergic system are particularly evident during adolescence, and have been proposed to contribute to the increased vulnerability to mental disorders seen during this period[3].

Dopaminergic cells located in the substantia nigra and ventral tegmental area project to several forebrain regions[4]. These dopaminergic inputs reach neurons expressing specific dopamine receptors, with the most common types being the dopamine 1 and 2 receptors (D1R and D2R)[5]. These receptors distinctively contribute to several higher cognitive functions such as attention, goal-directed behavior, reward processing, and memory[6–9]. To discern the putative role of dopamine in the ontogeny of different mental disorders, we need a detailed understanding of the typical development of the dopaminergic system.

Neuroanatomical information describing the dopamine receptor positive neurons have so far been sparse, with studies impeded by the lack of sensitive and specific antibodies for these receptors[10]. More recently, transgenic animals have proved useful for quantification of D1R and D2R cells[11,12]. In particular, Cullity and colleagues performed a stereological study to quantify the cells expressing these two receptors in five regions of the rostral forebrain[10]. This investigation has generated a substantial body of histological data that is useful for addressing hypotheses beyond those addressed in the original publication.

We here present the comprehensive collection of immunohistochemically-stained material used in the study by Cullity and colleagues[10]. While the previous study used the collection to quantify cells in five brain regions and showed example images of the sections, the current study digitizes and presents the entire collection as an online resource of high-resolution images. Thus, we here make this valuable collection available

[1]Neural Systems Laboratory, Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway. [2]Mental Health Theme, Florey Institute of Neuroscience and Mental Health, Melbourne, Australia. [3]ISN Psychology, Institute for Social Neuroscience, Ivanhoe, Australia. [4]IMPACT – the Institute for Mental and Physical Health and Clinical Translation, School of Medicine, Deakin University, Geelong, VIC, Australia. ✉e-mail: drjeehyunkim@gmail.com

https://doi.org/10.1038/s41597-022-01268-8

- An EBRAINS Data Descriptor can be leveraged for a journal publication (Nature Scientific Data, F1000, Frontiers etc.)
  - Bjerke et al., 2022, Nature SciData describing a collection of datasets in the EBRAINS Knowledge Graph

PROJECT

Map of dopamine receptor positive cell types in the developing and adult mouse brain (DOPAMAP)

Overview

Datasets

Distribution of dopamine 1 receptor positive neurons in the adolescent female mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the adolescent male mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the adult female mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the adult male mouse brain
Distribution of dopamine 1 receptor positive neurons in the juvenile female mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the juvenile male mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the late adolescent female mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the late adolescent male mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the preadolescent female mouse brain v1
Distribution of dopamine 1 receptor positive neurons in the preadolescent male mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the adolescent female mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the adolescent male mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the adult female mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the adult male mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the juvenile female mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the juvenile male mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the late adolescent female mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the late adolescent male mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the preadolescent female mouse brain v1
Distribution of dopamine 2 receptor positive neurons in the preadolescent male mouse brain v1

https://search.kg.ebrains.eu/instances/97bb7313-f6e8-4d62-b2df-4fa542c6a496

Take away

- Applicants are invited to contact flag-era.JTC2023@ebrains.eu if they have any questions related to curation needs
- Find FAIR data at ERBAINS: https://search.kg.ebrains.eu/
- EBRAINS Data usage terms: https://ebrains.eu/terms
- ATLAS services at ERBAINS: https://ebrains.eu/services/atlases/
- Share data at EBRAINS: https://ebrains.eu/service/share-data

EBRAINS

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